

CLAIMS

1. A medical fluid delivery system, comprising  
an implantable medical lead including a proximal port, a distal port, a lumen extending between the proximal port and the distal port and a distal fixation element adapted to secure the lead to a tissue site such that the distal port is in proximity to the tissue site; and  
a fluid delivery device adapted to pass through the lead proximal port, through the lead lumen and through the lead distal port, the device including a tissue piercing distal tip and a pre-formed curve in proximity to the distal tip such that the tip is directed away from the fixation element after passing beyond the distal port of the lead.
2. The system of claim 1, wherein the fluid delivery device is formed of a material comprising a shape memory alloy.
3. The system of claim 1, wherein the fluid delivery device is formed from a material comprising a super-elastic material.
4. The system of claim 1, further comprising means for adjusting a position of the device distal tip with respect to the lead distal port.
5. The system of claim 4, wherein the means for adjusting the position of the device distal tip comprises a threaded interface formed between the fluid delivery device and the lead lumen.
6. The system of claim 1, further comprising a locking mechanism adapted to hold the fluid delivery device in a stable position within the lead lumen and including a lead-clamping portion and a fluid delivery device-clamping portion.

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7. The system of claim 4, further comprising:

a locking mechanism adapted to hold the fluid delivery device in a stable position within the lead lumen and including a lead-clamping portion and a fluid delivery device-clamping portion; and

wherein the means for adjusting the position of the device distal tip comprises a threaded interface formed between the lead-clamping portion and the device-clamping portion of the locking mechanism.

8. The system of claim 6, wherein:

the implantable medical lead further includes a proximal connector pin formed about the proximal port; and

the locking mechanism is affixed to the connector pin via a set-screw.

9. The system of claim 8, wherein the set-screw forms an electrical coupling between an electrical probe and the connector pin.

10. The system of claim 6, wherein the device-clamping portion of the locking mechanism includes a chuck mechanism for engaging the device.

11. The system of claim 4, wherein the means for adjusting the position of the device distal tip further comprises a stop limiting a maximum distance between the device distal tip and the lead distal port.

12. The system of claim 4, wherein the means for adjusting the position of the device distal tip further comprises a fluid delivery device position indicator.

13. The system of claim 1, wherein:

the implantable medical lead further includes a coiled conductor forming a portion of the lumen;

the device distal tip includes a beveled end; and

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the coiled conductor includes a one or more filars having a pitch adapted to prevent the beveled end of the distal tip from catching in the coil as the device passes through the lumen.

14. The system of claim 4, wherein:

the implantable medical lead further includes a proximal connector pin formed about the proximal port and an elongated conductor electrically coupling the connector pin to the fixation element;

the fluid delivery device further includes a proximal end and a conductive element extending between the proximal end and the device distal tip; and

the means for adjusting the position of the device distal tip comprises an impedance monitor coupled to the connector pin of the lead and the proximal end of the needle, the impedance monitor adapted to measure an electrical impedance change between the distal tip of the device and the fixation element when the bolus of fluid is injected through the device.

15. The system of claim 4, wherein:

the fluid delivery device further includes a proximal end; and

the means for adjusting the position of the device distal tip comprises a pressure monitor coupled to the proximal end of the device and adapted to measure a pressure change when the bolus of fluid is injected through the device.

16. The system of claim 4, wherein:

the fluid delivery device further includes a distal portion, electromagnetic receiver coils wound around the distal portion and a pair of insulated conductors coupled to the receiver coils and adapted to deliver a magnetically induced current from the coils to a signal converter; and

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the means for adjusting the position of the device distal tip comprises an electromagnetic imaging or mapping system including the signal converter.